REMARKS

Applicants submit these remarks in response to the Office Action dated January 30, 2004 ("Office Action"). Applicants have also filed a two-month Petition for Extension of time and believe that this extension of time is effective to allow timely filing of a response up to and including June 30, 2004. In the event that Applicants are incorrect in their assumption, please charge any fee due in connection with this submission to Deposit Account No. 23-2415.

Claims 1-23 are pending in the application.

Hutcheson *et al.* Fails to Teach or Suggest Each Element of the Pending Claims

Claims 1-27 are rejected under 35 U.S.C 102 (b) as being anticipated by Hutcheson *et al.* (U.S. Patent Number 5,274,714). For the reasons discussed herein, Applicants respectfully disagree.

As noted by the Federal Circuit, anticipation under 35 U.S.C. § 102 occurs only "when the same device or method, having all of the elements contained in the claim limitations, is described in a single prior art reference." *Crown Operations International, Ltd. v. Solutia, Inc.*, 289 F.3d 1367 (Fed. Cir. 2002). "A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim." *Trintec Industries, Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292 (Fed. Cir. 2002). Moreover, the "single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in the prior art." *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116 (Fed. Cir. 2002). *See also In re Spada*, 911 F.2d. 705, 708 (Fed. Cir. 1990) (stating that "the reference must describe the applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it."); *PPG Indus., Inc. v. Guardian Indus., Corp.*, 75 F.3d 1558 (Fed. Cir. 1996) ("To anticipate a claim, a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter.").

Applicants respectfully assert that because Hutcheson *et al.* fails to teach or suggest each element of the claimed invention, Hutcheson *et al.* does not anticipate claims 1-27.

Hutcheson et al. fails teach or suggest "selecting k patterns from said set of input patterns to form a subset of patterns"

The Examiner alleges that the step of "selecting k patterns from said set of input patterns to form a subset of patterns," as required by claims 1-22, 26, and 27, is disclosed by Hutcheson *et al.* Fig. 7, element 940.[1] Office Action at p. 2. For at least the reasons discussed below, Applicants respectfully disagree.

Hutcheson *et al.* describe sorting image data into categories of a sort; *i.e.* "of the same subject." The number of images involved is as many as comprise the database to be processed–"[a]ll available images are preferably input . . . to the . . . Subsystem 240 and processed . . . ." Hutcheson *et al.* at col. 25, ll. 2-4. Nothing is performed on any one image that is not performed on the rest of the images in the dataset. *See, e.g., id.* at col. 25, ll. 31-32 ("[a]ll the mean matrices . . . are averaged yielding an overall sample mean matrix"); *id.* at col. 25, ll. 45-48 ("all individuals" are entered for training and a back-propagation algorithm is used to train on "all examples"). Furthermore, all the data in Hutcheson *et al.* is specifically categorized; *i.e.* put into subgroups "of the same subject." *See, e.g.,* Hutcheson *et al.* at col. 25, ll. 2-4. Whether this means that each group consists of images of the same content (*e.g.,* an individual) or that each group consists of the same type (*e.g.,* male Caucasian vs. female Asian), the data within each subgroup share common characteristics. Thus, the method described by Hutcheson *et al.* does not select a subset of patterns.

Contrastingly, the "subset of patterns" described in claims 1-22, 26 and 27 of the instant application do not share common characteristics. Rather, the "subset of patterns" refers to a sample that is

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[1] Applicants respectfully point out that the drawing figures do not match the numbered elements recited by the Examiner. For example element 940 cannot be found in Fig. 7. Applicants assume for the purpose of this response that the Examiner is referring to element 940, and not figure 7. If Applicants are incorrect in this assumption, clarification is respectfully requested. Element 940 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g.,* Hutcheson *et al.* at col. 7, ll. 27-28 ("940 Sort Images into Subgroups of Images of Same Subject"); *id.* at col. 25, ll.

extracted either at random, systematically, or semi-systematically from the rest of the data and then statistically processed to give a representative sample of the whole set. *See, e.g.,* Agrafiotis *et al.* at p. 13, ¶ 43. Thus, unlike the method described by Hutcheson *et al.*, claims 1-22, 26, and 27 neither require that all the input patterns be automatically characterized or describe what *ought* to characterize the sample. Rather, the step of "selecting k patterns from said set of input patterns to form a subset of patterns" requires that from the input patterns, k patterns be selected prior to characterization.

Thus, because Hutcheson *et al.* fails to teach or suggest "selecting k patterns from said set of input patterns to form a subset of patterns," Applicants respectfully assert that Hutcheson *et al.* does not anticipate claims 1-22, 26 and 27.

Hutcheson et al. fails to teach or suggest "determining at least some pairwise relationships between at least some of the patterns in said subset of patterns"

The Examiner alleges that the step of "determining at least some pairwise relationships between at least some of the patterns in said subset of patterns . . .," as recited in claims 1, 15, 26, and 27 of the instant application, is anticipated by Hutcheson *et al.* Fig. 7, element 960.[2] Office Action at p. 2. For at least the reasons discussed below, Applicants respectfully disagree.

8-9 ("The image data is sorted into subgroups 940. Each subgroup consists of images of the same subject").

[2] Applicants respectfully point out that the drawing figures do not match the numbered elements. For example element 960 cannot be found in Fig. 7. Applicants assume for the purpose of this response that the Examiner is referring to element 960, and not figure 7. If Applicants are incorrect in this assumption, clarification is respectfully requested. Element 960 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g.,* Hutcheson *et al.* at col. 7, l. 29 ("960 Create In-Class Variation Matrix"), *Id.* at col. 25, ll. 14-18 ("The mean component by component deviation from that matrix is then calculated and the mean deviation matrices of all individual In-classes is then averaged. The resultant matrix is the In-Class Variation Matrix 960"); and *Id.* At col. 25, ll. 21-26 ("An alternative method: The mean absolute pair-wise component by component difference of the matrices of all members of the In-Class subgroup is calculated and the mean deviation matrices of all individual in-classes is then averaged. The resultant matrix is the In-Class Variation Matrix 960").

The In-Class Variation Matrix described by Hutcheson *et al.* is an **averaging of deviations from an average of values** carried out on at least two levels. *See id.* at col. 25, ll. 14-18. Furthermore, Hutcheson *et al.* establish an exemplary profile for images of a single object type, as when an operator takes pictures of a subject in various poses to establish a template. *See id.* at col. 14, ll. 18-21.

Contrastingly, the instant application specifies determining pairwise relationships -- "a numerical measure of the relationship between two objects" -- between patterns in the subset. Agrafiotis *et al.* at p. 10, ¶ 35. Additionally, because the presently claimed invention requires that pairwise relationships are created between each pattern selected and that those pairwise distances are used to map the images, which are representative of the pairswise relationships, all information is preserved and intact thereby preventing loss of information via averaging. *See, e.g.,* Agrafiotis *et al.* at p. 6, ¶ 13. Thus, unlike Hutcheson *et al.*, the present invention discerns the real differences between each different object that is selected.

Because Hutcheson *et al.* fails to teach or suggest "determining at least some pairwise relationships between at least some of the patterns in said subset of patterns," Applicants respectfully assert that Hutcheson *et al.* does not anticipate claims 1-22, 26 and 27.

> *Hutcheson et al does not teach or suggest "mapping the patterns . . . into a set of images in an m-dimensional space . . . so that at least some of the pairwise distances between at least some of the images are representative of the relationships of the respective patterns"*

The Examiner alleges that the step of "mapping the patterns . . . into a set of images in an m-dimensional space . . . so that at least some of the pairwise distances between at least some of the images are representative of the relationships of the respective patterns . . .," as used in claims 1-22, 26, and 27, is anticipated by Hutcheson *et al.* Fig. 7, element 960.[3] Office Action at p. 2-3. For at least the reasons discussed below, Applicants respectfully disagree.

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[3] Applicants respectfully point out that the drawing figures do not match the numbered elements. For example element 960 cannot be found in Fig. 7. Applicants assume for the purpose of this response that the Examiner is referring to element 960, and not figure 7. If Applicants are incorrect

As discussed above, Hutcheson *et al.*'s distances of points from an average, which is represented in the In-Class Variation Matrix, is not the same as the instant application's distances between points, which is further replicated in m-dimensional space. In Hutcheson *et al.* all the information is classified into subgroups. The mean differences between each image within a subgroup is calculated and the average of the mean deviation determined. This results in the matrix for each subgroup. Thus, averages obtained in Hutcheson *et al.* do not allow for pairwise distances between selected images to be representative of the relationships of the respective patterns.

As previously discussed, the instant application seeks to preserve pairwise relationships between two objects into an m-dimensional space such that the distances between the objects that are mapped closely resemble the corresponding pairwise measurements. *See, e.g.,* Agrofiotis *et al.* at p. 10 ¶36. Because averages between all the images are not calculated, the pairwise distances between the images are representative of the relationships in the patterns.

Thus, because Hutcheson *et al.* fails to teach or suggest "mapping the patterns . . . into a set of images in an m-dimensional space . . . so that at least some of the pairwise distances between at least some of the images are representative of the relationships of the respective patterns," Applicants respectfully assert that Hutcheson *et al.* does not anticipate claims 1-22, 26 and 27.

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in this assumption, clarification is respectfully requested. Element 960 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g.,* Hutcheson *et al.* at col. 7, l. 29 ("960 Create In-Class Variation Matrix"), *id.* at col. 25, ll. 14-18 ("The mean component by component deviation from that matrix is then calculated and the mean deviation matrices of all individual In-classes is then averaged. The resultant matrix is the In-Class Variation Matrix 960"); and *id.* at col. 25, ll. 21-26 ("An alternative method: The mean absolute pair-wise component by component difference of the matrices of all members of the In-Class subgroup is calculated and the mean deviation matrices of all individual in-classes is then averaged. The resultant matrix is the In-Class Variation Matrix 960").

Hutcheson et al. does not teach or suggest "determining c n-dimensional reference points," "partitioning T into c disjoint clusters Cj based on a distance function," or " using a supervised machine learning technique to determine c independent mapping functions . . . based on the respective subsets Ci of the training set T"

The Examiner alleges that the further limitations of "determining c n-dimensional reference points," "partitioning T into c disjoint clusters Cj based on a distance function," and "using a supervised machine learning technique to determine c independent mapping functions . . . based on the respective subsets Ci of the training set T," as presented in dependent claims 3-12, are each anticipated by Hutchison *et al.* Office Action at p. 3-5.[45] For at least the reasons discussed below, Applicants respectfully disagree.

In addition to the differences discussed above regarding claims 1-22, 26, and 27, there are several further distinctions between pending claims 3-12 and the embodiments described by Hutcheson *et al.* For example, Hutcheson *et al.* describe loading neural net weights and cluster data in preparation for searching the neural net and describe searching a previously made neural net. In contrast, the instant application describes creating Voronoi-like cells in m-dimensional space prior to mapping with localized neural nets. *See, e.g.,* p. 24-25, ¶¶ 74-75. Thus, while Hutcheson *et al.* describe a neural

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[4] Applicants respectfully point out that the drawing figures do not match the numbered elements. For example element 790 cannot be found in Fig. 8. Applicants assume for the purpose of this response that the Examiner is referring to element 790, and not figure 8. If Applicants are incorrect in this assumption, clarification is respectfully requested. Element 790 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g.,* Hutchison *et al.* at col. 7, l. 10 ("790 Load Neural Network Weights and Cluster Data"), and *id.* at col. 17, ll. 58-62 ("After loading the neural network weights and cluster data 790 (FIG. 15), the neural network is searched with standard neural network techniques by applying the Query Feature Vector 800 using the neural network structures and weights"). Element 800 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g., Id.* at col. 7, l. 11 ("800 Apply Query Feature Vector to Neural Network") and *id.* at col. 17, ll. 58-62 ("After loading the neural network weights and cluster data 790 (FIG. 15), the neural network is searched with standard neural network techniques by applying the Query Feature Vector 800 using the neural network structures and weights").

[5] Additionally, Applicants assume for the purpose of this response that the Examiner is referring to element 800, not figure 8.

net being queried, the neural net in the present invention is generated in the method and then queried.

Additionally, the "cluster" referred to by Hutcheson *et al.* is a population of similar objects and is one among potentially many such clusters within a single neural net system. *See, e.g.,* Hutcheson *et al.* at col. 17, ll. 26-27. The clustering referred to by Hutcheson *et al.* is defined as a "population of objects with the same address" in a neural net. *See* Hutcheson at col. 17, ll. 26-27. Hutcheson *et al.* teach a neural net made incorporating all data in a dataset, whereby clusters are also made from consideration of all the data rather than just a sample of the data. In addition, Hutcheson *et al.* does not describe an embodiment involving a partitioning of the dataset into Voronoi-like clusters.

On the other hand, pending claims 3-12 of the instant application describe the creation of multiple neural nets each centered around a different data point. These points serve as focal reference centers around which clusters of data points within a threshold distance are grouped. Thus, according to claims 3-12 of the present invention, a separate neural net is used to derive a mapping function for a given cluster. In the present invention, the space being partitioned into disjoint clusters is training set "T".

Thus, because Hutcheson *et al.* fails to teach or suggest "determining c n-dimensional reference points," "partitioning T into c disjoint clusters Cj based on a distance function," or " using a supervised machine learning technique to determine c independent mapping functions . . . based on the respective subsets Ci of the training set T," Applicants respectfully assert that Hutcheson *et al.* does not anticipate claims 3-12.

Hutcheson et al. does not teach or suggest validation of their Fourier transformations into Fourier space

The Examiner alleges that the limitations of dependent claim 13 are anticipated by Hutcheson *et al.*, Fig. 7, elements 940 and 960.[6] Office Action at p. 15. However, Hutcheson *et al.* fails to teach or

[6] Applicants respectfully point out that the drawing figures do not match the numbered elements. For example elements 940 and 960 cannot be found in Fig. 7. Applicants assume for the purpose of

suggest validation of their Fourier transformations into Fourier space as required by claim 13 of the instant application. *See, e.g.,* Hutcheson *et al.* at col. 25, ll. 8-18. Claim 13 of the present invention teaches that where the coordinates of objects, as they are mapped in the m-dimensional nonlinear map, are revised to reflect the actual relationships between the objects more accurately. *See, e.g.,* Agrafiotis *et al.*, at p. 19, ¶ 57, *id.* at p. 19-20, ¶ 60.

Thus, because Hutcheson *et al.* fails to teach or suggest validation of their Fourier transformations into Fourier space, Applicants respectfully assert that Hutcheson *et al.* does not anticipate claim 13.

Hutcheson et al. does not teach or suggest "a selecting procedure that enables the processor to select a plurality of patterns from a database for similarity" or the use of two computers to carry out the methods described

The Examiner alleges that the limitation of "a selecting procedure that enables the processor to select a plurality of patterns from a database for similarity" as recited in claims 23 is anticipated by Hutcheson *et al.*, Fig. 7, element 940.[7] Office Action at p. 10. For at least the reasons discussed below, Applicants respectfully disagree.

Hutcheson *et al.* describes software for acquiring images from a camera, digitizing them, and processing them. *See* Hutcheson *et al.* at col. 14, l. 26 - col. 17, l. 4. The number of images

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this response that the Examiner is referring to elements 940 and 960, and not figure 7. If Applicants are incorrect in this assumption, clarification is respectfully requested. Element 940 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g.,* Hutchison *et al.* at col. 7, ll. 27-28 ("940 Sort Images into Subgroups of Images of Same Subject"), and *id.* at col. 25, l. 8 ("The image data is sorted into subgroups 940"). Element 960 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g., id.* at col. 7, ll. 29-30 ("960 Create In-Class Variation Matrix"), and *id.* at col. 25, ll. 14-18 ("The mean component by component deviation from that matrix is then calculated and the mean deviation matrices of all individual In-classes is then averaged. The resultant matrix is the In-Class Variation Matrix 960").

[7] Applicants respectfully point out that the drawing figures do not match the numbered elements. For example element 940 cannot be found in Fig. 7. Applicants assume for the purpose of this response that the Examiner is referring to element 940, and not figure 7. If Applicants are incorrect in this assumption, clarification is respectfully requested. Element 940 is described in Hutcheson *et al.* throughout the specification and drawings. *See, e.g.,* Hutcheson *et al.* at col. 7, ll. 27-28 ("940

involved is as many as are comprised the database to be processed, *See id.* at col. 25, ll. 2-4 ("[a]ll available images are preferably input . . . to the . . . Subsystem 240 and processed . . . ."). Indeed, nothing is performed on any one image that is not performed on the rest of the images in the dataset. In method 1, "[a]ll the mean matrices' are averaged yielding an overall sample mean matrix." *Id.* at col. 25, ll. 31-32. In method 2, "all individuals" are entered for training and a back-propagation algorithm is used to train on "all examples." *Id.* at col. 25, ll. 45-48. As a result, Hutcheson *et al.* does not provide a means for the system to select a sampling of objects for machine learning and therefore does not "select[ed] pair of patterns" as mentioned in Claim 23 of the instant application.

Contrastingly, the instant application describes "selecting objects for comparison" *See, e.g.,* Agrafiotis *et al.* at p. 13 ¶ 42. Thus, because Hutcheson *et al.* fails to teach or suggest a selecting step, Applicants respectfully assert that the Examiner's rejection of claims 23-25 under 35 U.S.C. § 102(b) is improper.

Furthermore, Hutcheson *et al.* teach only the use of a single computer operating independently of others (*i.e.* a network of multiple computers connected together is not suggested). Specifically, Hutcheson *et al.* fails to teach or suggest a central machine that transmits and receives information with remote machines as required by claims 23-25 of the instant application.

The instant application describes a computer program product whereby data is "transmitted" to remote computers and similarity information about the data is "received" back. *See, e.g., id.* at p. 13 ¶ 42; *id at* p. 14 ¶ 46, and pending claim 23. Thus, unlike the method described in Hutcheson *et al.*, the computer program product of pending claim 23 requires the use of at least two computers.

Because Hutcheson *et al.* fails to teach or suggest "selecting procedure that enables the processor to select a plurality of patterns from a database for similarity" or the use of two computers to carry out the methods described, Applicants respectfully assert that Hutcheson *et al.* does not anticipate claim 23-25.

Sort Images into Subgroups of Images of Same Subject"), and *id.* at col. 25, l. 8 ("The image data is sorted into subgroups 940").

CONCLUSION

Applicants believe that for the reasons set forth above, claims 1-27 are in condition for allowance and respectfully request prompt and favorable action. Please charge any fee due in connection with this submission to Deposit Account No. 23-2415.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (858) 350-2319.

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI
Professional Corporation

Aubrey A. Haddach

Dated June 30, 2004

Aubrey A. Haddach, Agent for Applicant
Registration No. 48,374